Institute of Microbiology and Molecular Genetics
Faculty of Life Sciences
University of the Punjab, Lahore

Course Outline

Programme	BS	Course Code	MMG101	Credit Hours	3(2+1)
Course Title	FUNDAMENTALS OF MICROBIOLOGY				

COURSE INTRODUCTION

The main focus of the course of Microbiology involves the study of microorganisms with particular emphasis on the domain Bacteria and Archaea. This course introduces the basic principles of Microbiology, examining the microorganisms that inhabit our planet and their effects on plants, animals, and humans. Through theoretical and laboratory work, students will probe the science of microbes, and issues relevant to the field of Microbiology, including emerging infectious diseases and antibiotic resistance. Overall, students will be able to understand how microorganisms can be used as a model system to study other advanced disciplines of Microbiology.

LEARNING OUTCOMES

On the completion of the course, the students will be able to:

1. Develop fundamental skills to work with different microbiological laboratory techniques.
2. Apply their microbial structure, growth, and metabolism knowledge to identify unknown microorganisms.
3. Identify major microbial interactions and illustrate how these interactions affect the well-being of humans, plants, and animals.
4. Work with diagnostic laboratories, the food industry, and academic and research organizations.

COURSE CONTENT

History of microbiology: The golden age of microbiology, Modern development of microbiology, History of classification of prokaryotes, Microscopy: Types of light and electron microscopy, The structure and organization of prokaryotic cells: Structures external to the bacterial cell wall (glycocalyx, flagella, fimbriae, and pili), Bacterial cell wall, Internal structures, Inclusions, and Endospores, The cultivation of bacteria: Chemical requirements, Nutritional types of bacteria, Types of culture media, Physical requirements for microbial growth, Microbial growth: Bacterial growth curve, Direct measurement of microbial growth, Isolation of pure cultures, Methods for the preservation of bacterial cultures, Microbial metabolism: Comparative study of Embden-Meyerhof, Pentose phosphate, and Entner-Doudoroff pathways in Prokaryotes, Microbial symbiotic relationships: Positive and negative interactions, Control of microorganisms: Physical methods and chemical agents.

PRACTICALS

Laboratory techniques to study different methods of sterilization of bacterial culture media, Cultivation of bacteria on complex, selective, and differential media, Methods for the isolation of pure microbial cultures from soil and water, Staining techniques, simple staining, gram's staining, negative staining, endospore and capsule staining, biochemical characterization of bacteria.

TEXTBOOKS AND READING MATERIAL

1. Pommerville, J.C. (2022). *Fundamentals of Microbiology,* 12th Edition, Jones & Bartlett Learning, Burlington MA, United States.
2. Tortora, G.J., Funke, B.R., & Case, C.L. (2020). *Microbiology: An Introduction*, 13th Edition, Pearson Education, United States.
3. Willey, M.W., Sherwood, L.M., & Woolverton, C.J. (2017). *Prescott's Microbiology,* Tenth Edition, McGraw-Hill Education, New York, United States.
4. Talaro, K.P., & Chess, B. (2017). Foundations in Microbiology, 10th Edition, McGraw-Hill, New York, United States.
5. Madigan, M., Sattley, W., Aiyer, J., Stahl, D., & Buckley, D. (2021). *Brock Biology of Microorganism*, 16th Edition, Pears Education, United States.
6. Cappuccino, J. G., & Sherman, N. (2014). *Microbiology: A Laboratory Manual,* 10th Edition, Pearson Education, United States.
7. Black, J.G., & Black, L.J. (2017). *Microbiology: Principles and Explorations*, 10th Edition, John Wiley and Sons, N.Y.

ASSESSMENT

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on activities, short tests, projects, practicals, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on a term paper, research proposal development, fieldwork, report writing, etc.